



Arduino + 4 pin 5mm Full-Color LED

LED

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TOOLS:

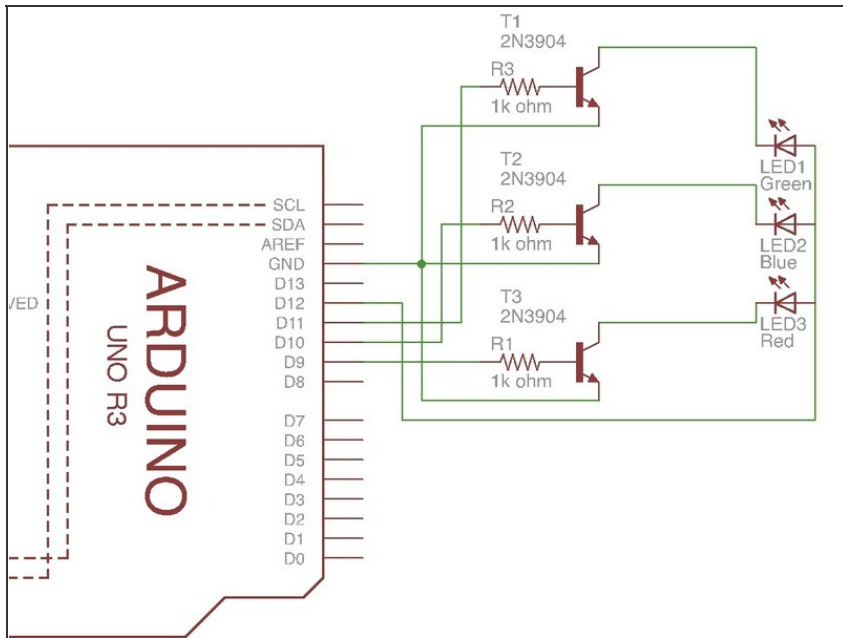
- [Computer running Windows, OSX or Linux \(1\)](#)





PARTS:

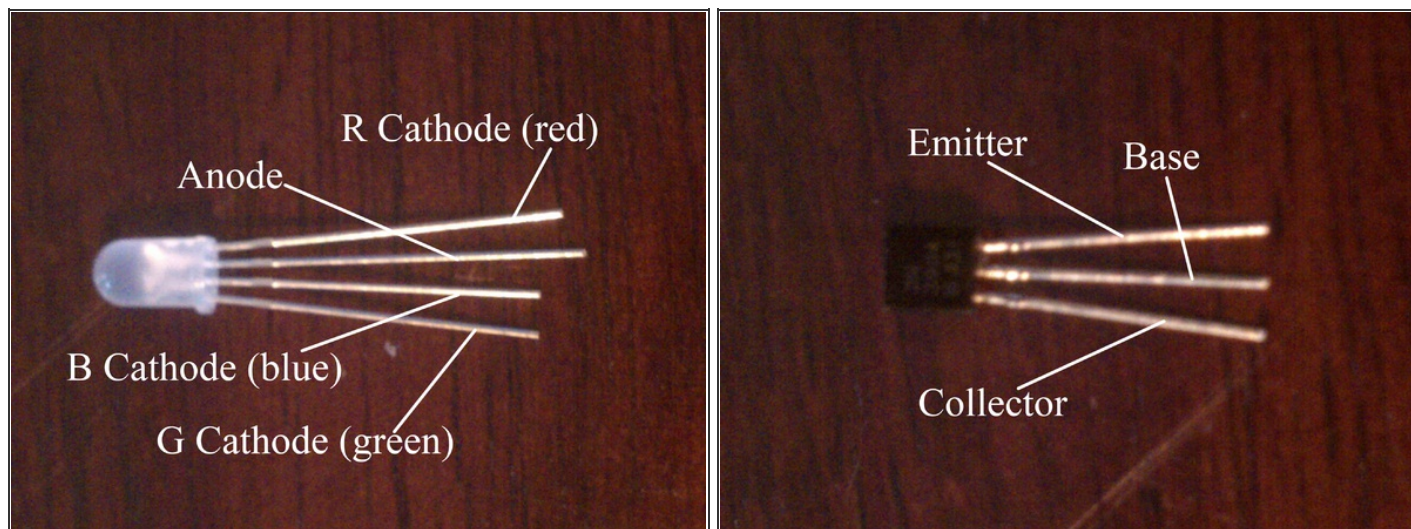
- [Transistor, NPN \(3\)](#)
- [Resistor \(3\)](#)
- [5mm Full-Color LED \(1\)](#)
- [Jumper Wire Pack \(1\)](#)
- [Arduino \(1\)](#)
- [Breadboard \(1\)](#)

Step 1 — Schematic



- This circuit uses an Arduino UNO but it still works on an Arduino MEGA 2560. 
- In this project we only use one 5mm LED, but since the LED has four pins, I used three LED symbols in place of the four-pin LED. The three cathodes of the LEDs in the schematic are the three cathodes on the Full-Color 5mm LED. The three anodes of the LEDs are the one anode on the Full-Color 5mm LED. 

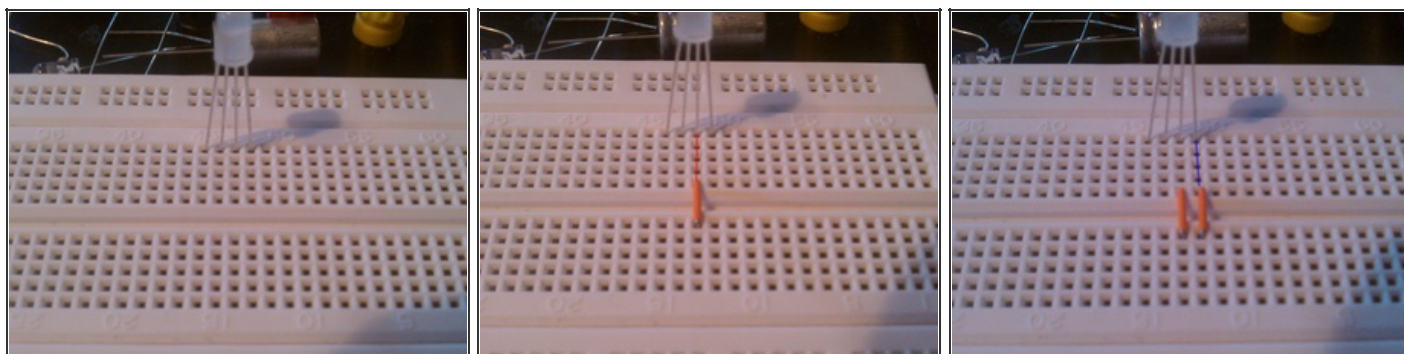
Step 2



- Remember, the longest pin of the LED is the anode, the other three short pins are the cathodes (RGB)
- Also, while the flat side of the transistor is facing you, the left pin is the collector, the middle is the base, and the right pin is the emitter.
- The photo notes the 2N2222 transistor. For the 2N3904 and 2N4401, the Collector and Emitter are switched.

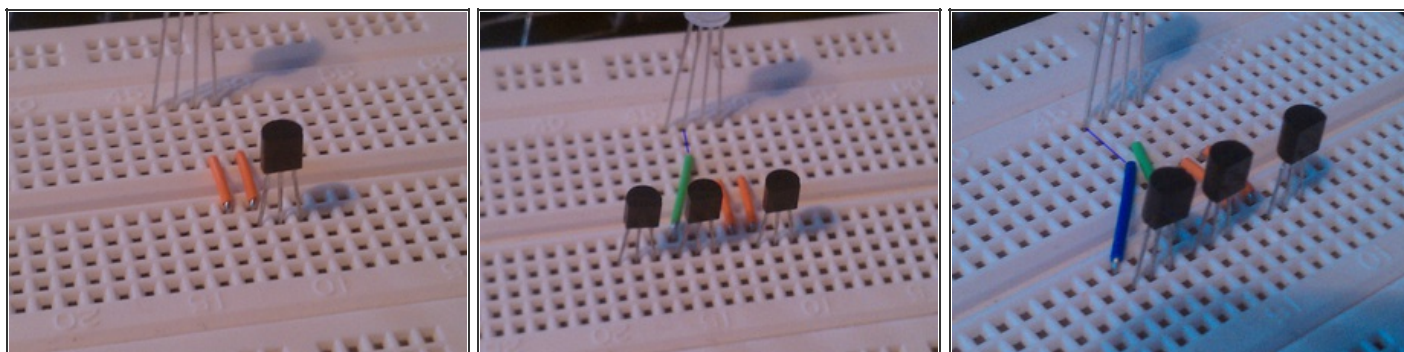



Step 3 — Circuit Assembly



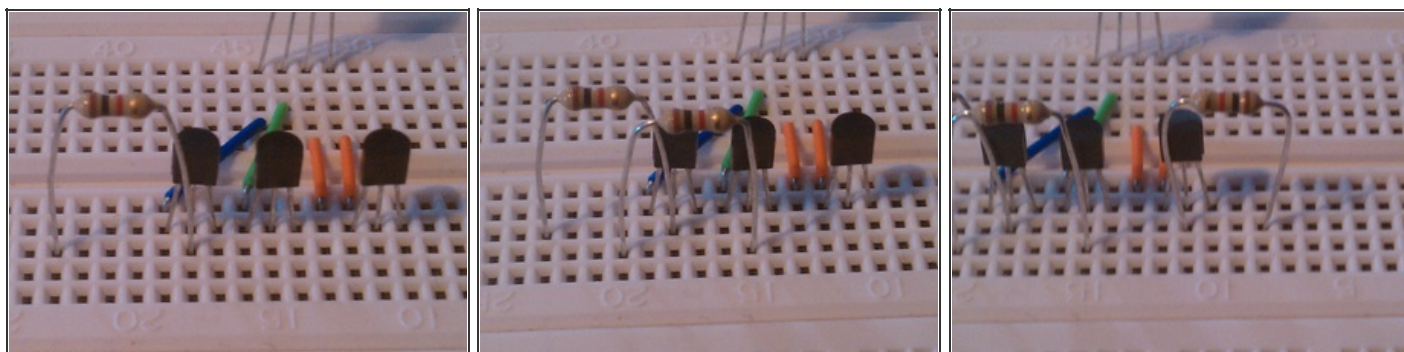
- Connect the LED to the breadboard.
- Connect the anode of the LED to the other half of the breadboard.
- Connect the cathode (frist pin) to the other side of the breadboard.

Step 4 — LED to Transistor



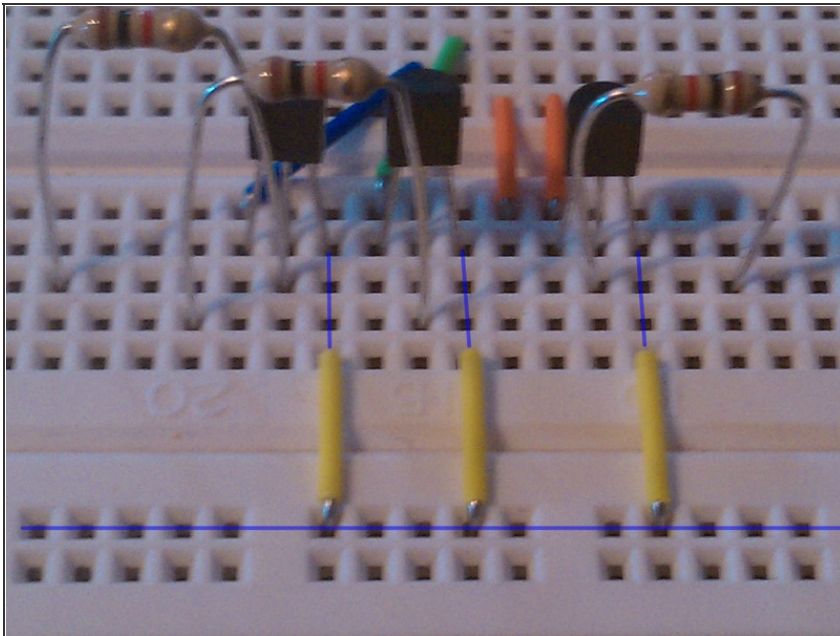
- Connect the collector of one transistor to the first cathode of the LED.
- Connect the other transistors as shown in the image. Connect the collector of the second transistor to the second cathode of the LED.
- Connect the collector of the third transistor to the third cathode of the LED.
- I'm using the 2N2222 transistor, so in my case the transistor faces my direction. If the 2N3904 or 2N4401 transistor are used, the transistor will face the opposite direction. 

Step 5 — Transistor to Resistor



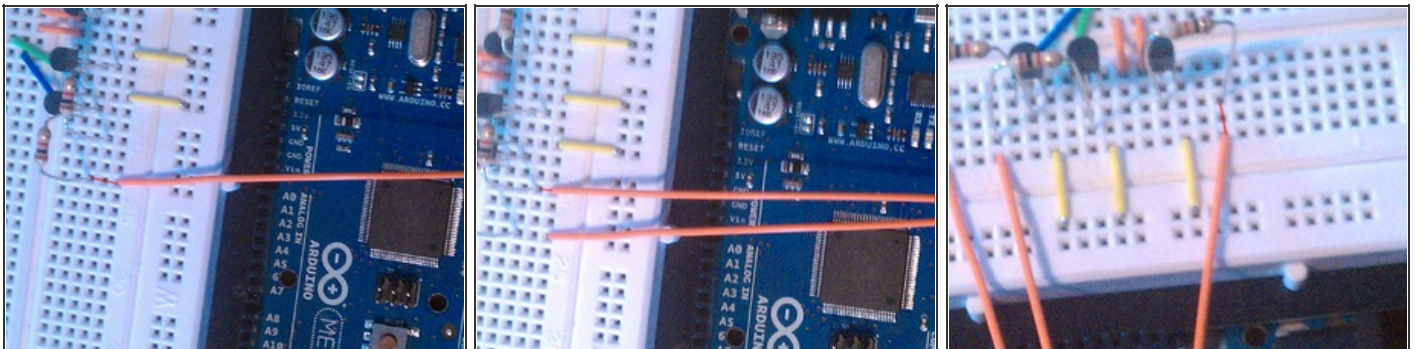
- Connect one resistor to the base of the third transistor.
- Connect the second resistor to the base of the second transistor.
- Connect the third resistor to the base of the first transistor.

Step 6 — Transistor to Ground



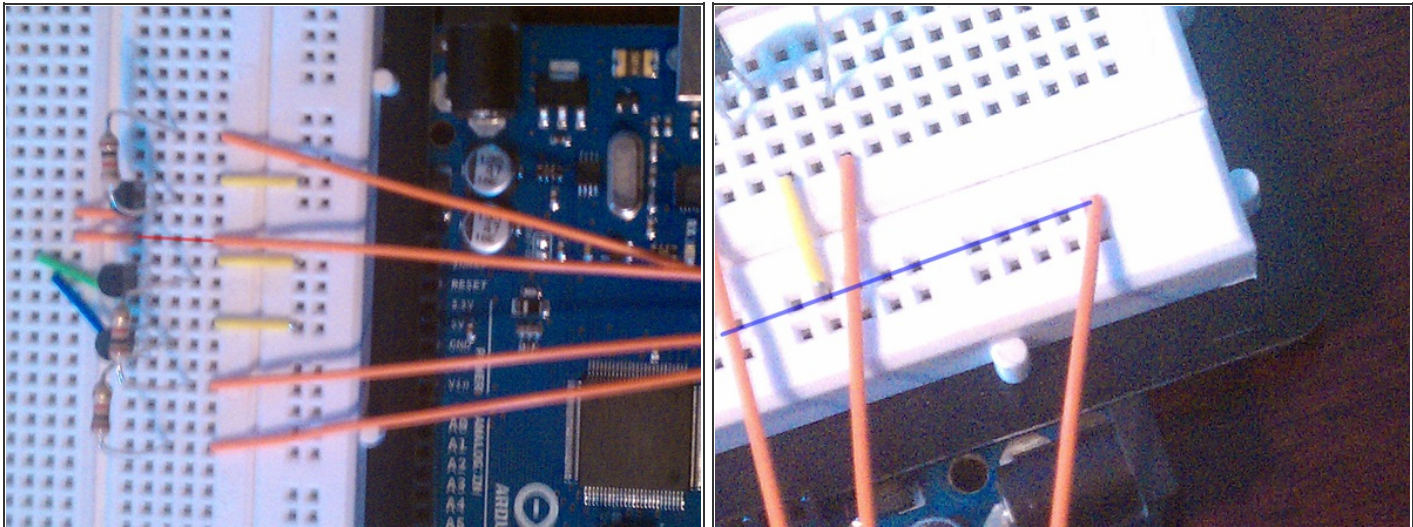
- Connect the emitter of all three transistors to ground.

Step 7 — Resistor to Arduino



- Connect the resistor from the third transistor to pin 9 on the Arduino.
- Connect the resistor from the second transistor to pin 10 on the Arduino.
- Connect the resistor from the first transistor to pin 11 on the Arduino.

Step 8 — Ground and LED anode to Arduino



- Connect the anode of the LED to pin 12 on the Arduino.
- Connect ground from the Arduino to the ground strip of the breadboard.

Step 9 — Arduino Program

```

// pin variables
int pwr = 12; // pin 12 is the power for the anode on the LED
int ledR = 11; // pin 11 is for the (red) R cathode of the LED
int ledB = 10; // pin 10 is for the (blue) B cathode of the LED
int ledG = 9; // pin 9 is for the (green) G cathode of the LED

void setup() {
  // start serial/serial monitor
  Serial.begin(9600);

  // define pins
  pinMode(pwr, OUTPUT);
  pinMode(ledR, OUTPUT);
  pinMode(ledB, OUTPUT);
  pinMode(ledG, OUTPUT);
}

void loop() {
  // only activates serial when available
  while (Serial.available() == 0);

  // the value (val) is the input of the serial monitor
  /* we subtract the input from zero because the output of an input
  character on an arduino is a decimal data type. So if I input 1, the
  output is 49. The output of zero is 48, therefore inputing 1, which is
  49 - 48 = 1. We then receive our character data type. */
  int val = Serial.read() - '0';

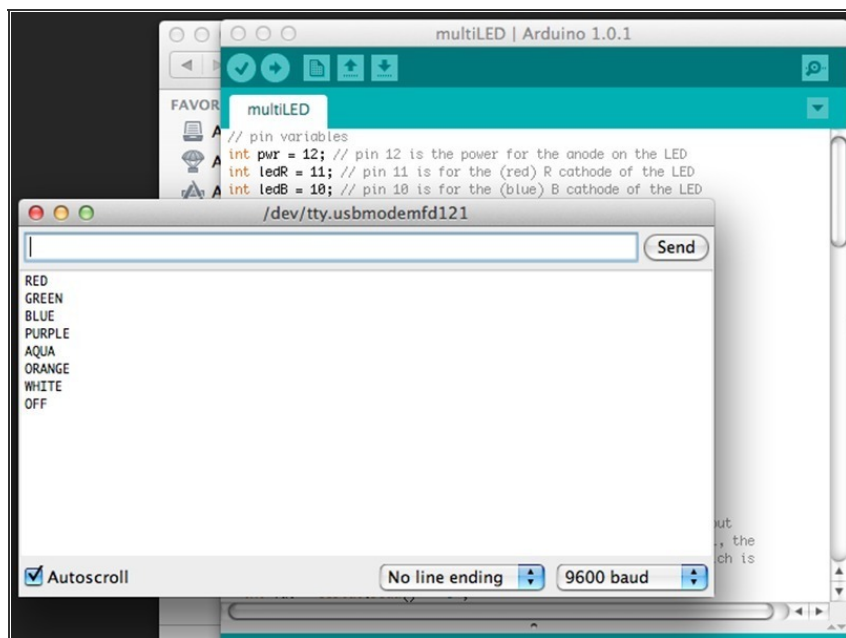
  // turn on pwr pin, that is the anode of the LED
  digitalWrite(pwr, HIGH);

  // use the switch function for led value (val)
  switch (val) {
    // case 1: is the input of our value, in this case, if we input 1 in the serial
    case 1:
      // serial will print red for the R cathode of the LED
      Serial.println("RED");
      // turn off the (blue) B cathode of the LED
      digitalWrite(ledB, LOW);
      // turn off the (green) G cathode of the LED
      digitalWrite(ledG, LOW);
      // turn on the (red) R cathode of the LED
      digitalWrite(ledR, HIGH);
      // break stops the switch statement from continuing to the other statements
      break;
    case 2:
      Serial.println("GREEN");
      digitalWrite(ledR, LOW);
      digitalWrite(ledB, LOW);
      digitalWrite(ledG, HIGH);
      break;
    case 3:
      Serial.println("BLUE");
      digitalWrite(ledR, LOW);
      digitalWrite(ledB, HIGH);
      digitalWrite(ledG, LOW);
      break;
    // turning on more than one cathodes of the LED will emit other colors
    case 4:
      Serial.println("PURPLE");
      // turning on (red) R cathode and (blue) B cathode will create purple
      digitalWrite(ledR, LOW);
      digitalWrite(ledB, HIGH);
      digitalWrite(ledG, LOW);
      break;
    case 5:
      Serial.println("AQUA");
      digitalWrite(ledR, HIGH);
      digitalWrite(ledB, LOW);
      digitalWrite(ledG, HIGH);
      break;
    case 6:
      Serial.println("ORANGE");
      digitalWrite(ledR, HIGH);
      digitalWrite(ledB, HIGH);
      digitalWrite(ledG, LOW);
      break;
    // turning on all cathodes will create a whitish purple color
    case 7:
      Serial.println("WHITE");
      digitalWrite(ledR, HIGH);
      digitalWrite(ledB, HIGH);
      digitalWrite(ledG, HIGH);
      break;
    // this case turns the LED off
    case 8:
      Serial.println("OFF");
      digitalWrite(ledR, LOW);
      digitalWrite(ledB, LOW);
      digitalWrite(ledG, LOW);
      break;
    // if no case is defined or incorrect case is input, serial will print invalid
    default:
      Serial.println("INVALID");
      break;
  }
}

```

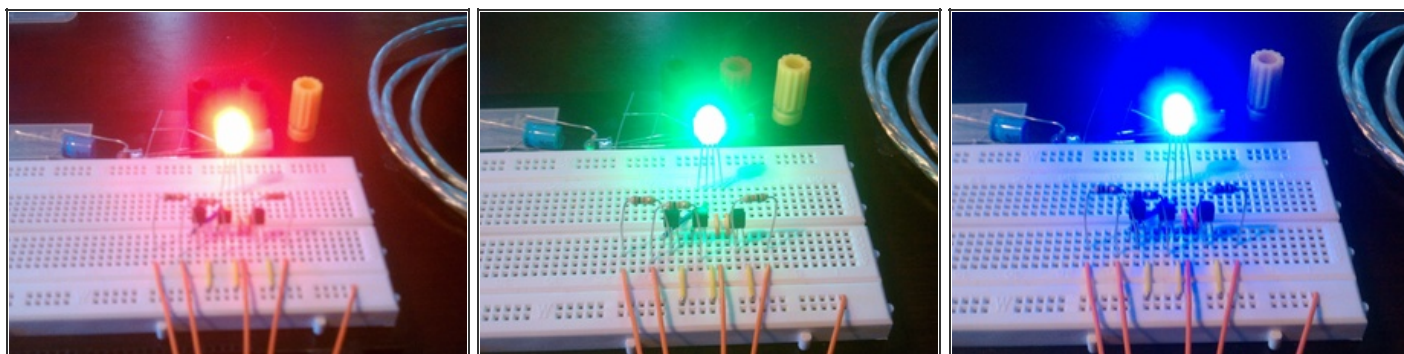
- Connect your Arduino to your computer (running Windows, OSX, Linux).
- Open the Arduino program and upload the Arduino code within the following images.

Step 10 — Arduino Serial Monitor Testing



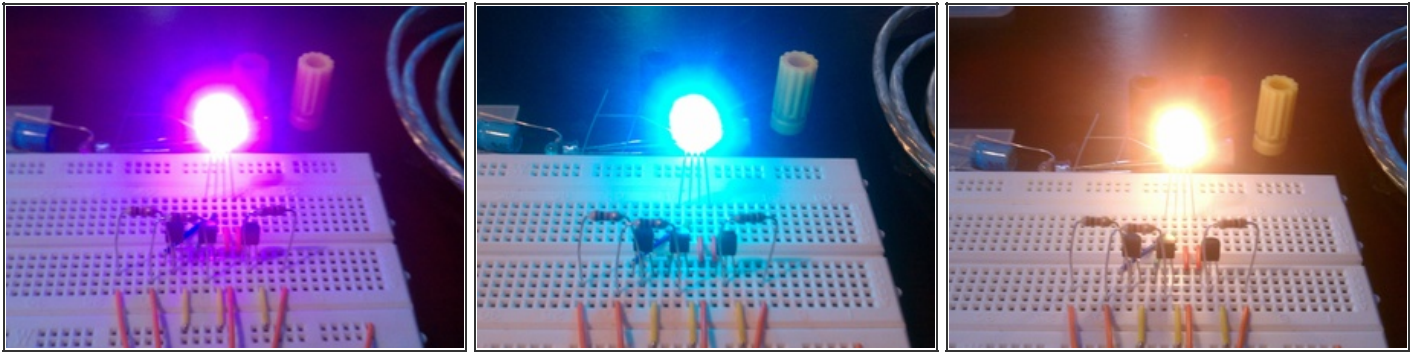
- After uploading the code, open the serial monitor and input a character from 1 - 8.
- 1 = RED, 2 = GREEN, 3 = BLUE
- The LED only has three pins for RGB (Red, Green, Blue), but turning on more than one pin creates diverse colors.
- 4 = PURPLE, 5 = AQUA, 6 = ORANGE, 7 = BRIGHT WHITISH PURPLE
- 8 = OFF

Step 11 — RGB colors



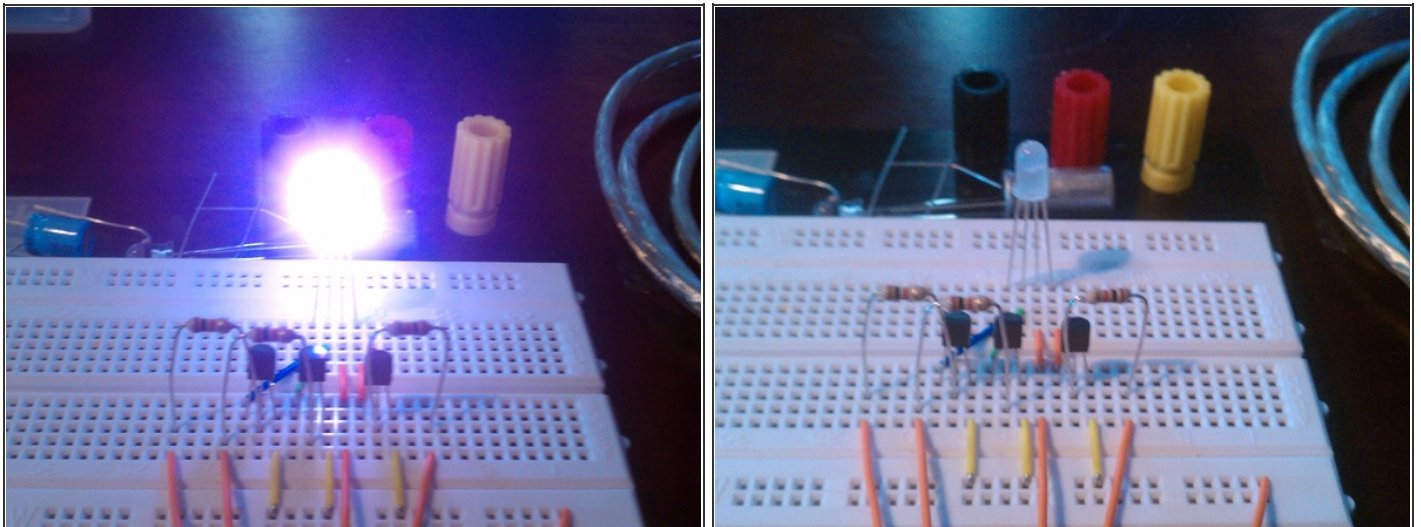
- Normal RGB light settings.

Step 12 — RB, GB, and RG colors



- Other RGB settings. RB, GB, or RG.

Step 13 — LED all on or off



- All RGB cathodes on or off.

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